DOCUMENT RESUME

ED 154 013 95 TM 007 021

AUTHOR	DiLuzio, Geneva J.; And Others
TITLE	Technical Manual for the Conceptual Learning and Development Assessment Series III: Noun. Technical Report No. 436. Reprinted December 1977.
INSTITUTION	Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
REPORT NO	WRDCCL-TR-436
PUB DATE	Dec 75
CONTRACT	NE-C-00-3-0065
NOTE	71p.; For related documents, see ED 103 484 and TM 007 020
EDRS PRICE	MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS	Abstraction Levels; Cognitive Development; Cognitive Measurement; Cognitive Processes; *Cognitive Tests; Complexity Level; *Concept Formation; Developmental Stages; Elementary Secondary Education; *Fundamental Concepts; Learning Theories; Measurement Goals; Nominals; Standardized Tests; *Statistical Data; *Test Construction; Test Items; Test Reliability
IDENTIFIERS	*Model of Conceptual Learning and Development; *Test Manuals

ABSTRACT

This document accompanies the Conceptual Learning and Development Assessment Series IV: Noun, a test constructed to chart the conceptual development of individuals. As a technical manual, it contains information on the rationale, development, standardization, and reliability of the test, as well as essential information and statistical data for evaluating the test. This report is designed to be used by individuals who have a general knowledge of test construction and measurement principles and are aware of the limitations of test interpretations. The authors of this manual have attempted to take into account and satisfy the standards set forth by the American Psychological Association regarding educational and psychological tests. The test is based upon the Conceptual Learning and Development (CLD) Model, which suggests four successive levels of concept learning: (1) concrete--recognizing an object which has been encountered previously; (2) identity--recognizing a known object when it appears in a different spatial, time, or sensory perspective; (3) classificatory--generalizing that two items are alike in some way; and (4) formal--naming and defining the concept, listing its attributes, and judging the presence of such attributes in an object. (Author/GDC)

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ED154013

Technical Report No. 436

TECHNICAL MANUAL FOR THE CONCEPTUAL LEARNING AND DEVELOPMENT ASSESSMENT SERIES III: NOUN

by Geneva J. DiLuzio, Conrad G. Katzenmeyer, and Herbert J. Klausmeier

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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TM007 021

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by

Geneva J. DiLuzio, Conrad G. Katzenmeyer
and Herbert J. Klausmeier

Report from the
Technical Services Section

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

December 1975

Reprinted December 1977

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the National Institute of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by that agency should be inferred.

Center Contract No. NE-C-00-3-0065

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The Wisconsin Research and Development Center is supported with funds from the National Institute of Education and the University of Wisconsin.

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ACKNOWLEDGMENTS

The writing of a technical manual to accompany a test requires the combined efforts of many people. Our first order of business is to thank Mr. Keith White, project specialist, for his efforts in collecting the data from which the test characteristics were computed. We also appreciate the efforts of Mr. Tom Sipple and Dr. Patricia Allen for providing detailed information about the test batteries. A special note of thanks goes to Mr. Edward Haertel, technical specialist, who performed the yeoman's work by analyzing the data.

Finally, a sincere thank you to Ms. Cathy Halverson and Ms. Julie Pohlkamp who so carefully typed our first draft.

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ABSTRACT

This technical manual is one of three related publications to be used with the Conceptual Learning and Development Assessment Series IV. Tree, a test constructed to chart the conceptual development of individuals. As a technical manual, it contains information on the rationale, development, standardization, and reliability of the test, as well as essential information and statistical data for evaluating the test.

This report is designed to be used by individuals who have a general knowledge of test construction and measurement principles and are aware of the limitations of test interpretations. The authors of this manual have attempted to take into account and satisfy the standards set forth by the American Psychological Association regarding educational and psychological tests.

An overview of the theoretical framework on which the test is based, a copy of the preliminary edition of the test battery, and directions for administration can be found in the Technical Report, Development of Conceptual Learning and Development Assessment Series IV: Tree (Klausmeier, Marliave, Katzenmeyer, & Sipple, 1974. Reprinted December 1977.)

The most complete source of information regarding the theoretical framework on which the test is based is in Conceptual Learning and Development: A Cognitive View (Klausmeier, Ghatala, & Frayer, 1974).

I

RATIONALE OF THE TEST

OVERVIEW OF THE CONCEPTUAL LEARNING AND DEVELOPMENT MODEL (CLD): THE BASES FOR TEST DEVELOPMENT

This technical manual provides information on the rationale, development, and statistical properties of the Conceptual Learning and Development Assessment Series III: Noun. The test battery is based upon the model of conceptual learning and development (CLD model) proposed by Klausmeier (1971) and more fully described by Klausmeier, Ghatala, and Frayer (1974). The CLD model is the theoretical framework which provides the basis for determining children's level of attainment and use of a particular concept.

The Conceptual Learning and Development Series III: Noun was developed in the course of research on the CLD model for use in typical school settings. By providing the researcher with a measure of conceptual attainment, it permits the study of the relationships of level of conceptual attainment, concept usage, internal conditions of concept learning, and instructional conditions (Klausmeier, Ghatala, & Frayer, 1974). The instrument is unique in that it provides a standardized measure of the level of attainment of the concept noun and the uses of that concept, and it can be group administered.

General Characteristics of the CLD Model

The general characteristics of the CLD model are summarized by Klausmeier, Ingison, Sipple, and Katzenmeyer (1973). It is an analytical,

descriptive model. It defines four successive levels of concept attainment and three types of concept usage. It specifies cognitive operations which are involved in learning concepts at each of the four levels. It relates internal and external conditions of learning to the specified levels.

Definition of Concepts

Klausmeier, Ghatala, and Frayer (1974) use the word concept to designate mental constructs of individuals as well as identifiable public entities which are part of the substance of various disciplines. Klausmeier, Davis, Ramsay, Fredrick, and Davies (1965) developed a definition of concept as an entity having a set of defining attributes, which is characteristic of concepts from a variety of disciplines. In addition, Klausmeier, Ghatala, and Frayer (1974) specified that most public concepts have eight attributes: learnability, usability, validity, generality, power, structure, instance numerousness, and instance perceptibility. Systematic analysis of a particular concept with regard to its various attributes is the method used to delineate the particular concept to be assessed by the battery and determine the format of the items used.

Structure of the Model

Levels of Concept Attainment. Four successive levels of concept attainment are specified by the model: concrete level, identity level, classificatory level, and formal level. Klausmeier, Ingison, Sipple, and Katzenmeyer (1973) describe the levels of attainment as follows:

> Attainment of a concept at the concrete level is inferred when the individual cognizes an object that he has experienced on a prior occasion. At this level, the object is experienced in exactly the

> same way on the second and later occasions. Attainment of a concept at the identity level is inferred when the individual cognizes an object as the same one previously encountered when observed from a different spatio-temporal perspective or sensed in a different modality. The attainment of a concept at the classificatory level is inferred when the individual treats at least two instances of the same set of things as equivalent. At this level the individual may be unable to name the attributes that are common to the instances. Attainment of a concept at the formal level is inferred when the individual can name the concept, discriminate and name the societally accepted defining attributes and values, and accurately evaluate instances as belonging or not belonging to the set in terms of the presence or absence of the defining attributes [p. 7].

The normative pattern postulated for individuals who are attaining a concept is to move successively from each level to the next higher level given the following conditions: First, the concept is of the kind for which there are either actual instances or representations of instances observable in the environment; and second, the individual has had experience with the instances beginning in early childhood (Klausmeier, Ghatala, & Frayer, 1974). It is acknowledged that some concepts are not attained at all four of the successive levels. This can occur either because of the nature of the concepts or because the learning experiences of the individual do not permit their acquisition.

Concept Utilization and Extension. Once a concept is attained at the classificatory or formal levels it may be used in four ways. The first is an example of horizontal transfer, in which the individual can use the attained concept in recognizing newly encountered examples and nonexamples. The three other uses, cognizing supraordinate-subordinate relations, cognizing various other relations among concepts, and generalizing to problem-solving situations, are examples of vertical transfer, in which individuals extend their knowledge

about an attained concept by using it. It is not implied that attainment of the concepts at the classificatory level or formal level will be followed by mastery of all the uses.

In cognizing supraordinate-subordinate relations, individuals can, after verbal instruction, place instances of hierarchically related concepts into proper groups and can justify their decisions based on the defining attributes of the group. At higher levels individuals are able to understand relationships described as the "whole is the sum of the parts" and "some but not all (Kofsky, 1966)." Understanding supraordinate-subordinate relationships increases the validity and usability of the individual's concepts (Klausmeier, Ghatala, & Frayer, 1974).

There are other statements of relation between or among concepts which involve causality, correlation, probability, or other valid relations. Being able to understand and use a valid relationship depends on knowledge of the concepts that are to be related. These types of relationships are different from relations among supraordinate and subordinate concepts (Klausmeier, Ghatala, & Frayer, 1974).

Problem solving is inferred in any situation where information about a concept or concepts is called into play and generalized to arrive at a solution to a particular problem. One example of concepts being used in problem solving is the application of familiar principles to new situations.

Other Characteristics of the Model

Information concerning the cognitive operations employed at each level of conceptual attainment and the internal and external conditions of learning necessary to concept attainment is presented in Conceptual Learning and Development: A Cognitive View (Klausmeier, Ghatala, & Frayer, 1974).

DESCRIPTION OF THE CONCEPTUAL LEARNING AND DEVELOPMENT ASSESSMENT SERIES III: NOUN

Scope of the Test Battery

There are six subtests used to assess the level of conceptual attainment: concrete level, identity level, classificatory level, evaluating and defining, naming, and discriminating attributes. The last three of these subtests are used to assess attainment of the formal level. Three additional subtests are used to assess concept usage: supraordinate-subordinate relations, principles, and problem solving.

This battery may be used with children of ages 4-18. It was standardized on children at four grade levels: 1, 4, 7, and 10. The span of age represented in the standardization sample provides sufficient information to examine the usability of each subtest for children of various ages. Two forms of the test were developed, primary and intermediate. For the primary form, only the concrete level and identity level subtests are administered. For the intermediate form, the concrete level and identity level subtests are omitted.

In the process of test development, some of the subtests constructed to measure desired outcomes were found to be too difficult or too easy for

children in some grades. Table 1 presents the set of subtests found to be most appropriate for administration at each of the four grade levels included in the standardization sample, as well as the number of items per subtest and average amount of time needed to administer each subtest for each form.

Concrete Level Subtest

This eight-item subtest is designed to assess whether a child has attained the concept noun at the concrete level. A noun is presented to the child. After the child has looked at the word for a few seconds, the child is asked to turn to the next page of the answer booklet and find the same word among four or seven words. The correct choice is presented in the same type font as on the preceding page. All instructions for this subtest are given orally and no written instructions appear.

The words used vary systematically with respect to type font, initial letter, and number of syllables. By varying the number of words serving as alternatives and the number of attributes on which the incorrect alternatives differ from the correct choice, items of varying difficulty are obtained. The placement of the correct choice among the distractors is varied randomly across the eight items.

Three type fonts, 17 initial letters, and two categories of number of syllables are employed. The type fonts used are elite type, upper case; primary type, lower case; and primary type, upper case. The initial letters used are a, b, c, d, e, f, g, h, j, m, n, p, q, r, s, t, and w. The words are classified by number of syllables as either monosyllabic or polysyllabic. All words employed are from three to eight letters in length.

TABLE 1

APPROPRIATENESS, AVERAGE ADMINISTRATION TIME, AND ITEM CONTENT OF THE VARIOUS SUBTESTS OF THE CONCEPTUAL LEARNING AND DEVELOPMENT ASSESSMENT SERIES III: NOUN FOR CHILDREN IN DIFFERENT GRADE GROUPS IN THE STANDARDIZATION SAMPLE

Subtest	Number of items				Average administration time in minutes			
	Primary form	Intermediate form			Primary form	Intermediate form		
	Grade 1	Grade 4	Grade 7	Grade 10	Grade 1	Grade 4	Grade 7	Grade 10
Concrete Level	8	NA	NA	NA	5	NA	NA	NA
Identity Level	8	NA	NA	NA				
Classificatory Level	NA	8	8	8	NA	7	7	7
Evaluating and Defining	NA	9	9	9	NA	10	10	10
Naming	NA	9	9	9	NA	10	10	10
Discriminating Attributes	NA	7	7	7	NA	7	7	7
Supraordinate-Subordinate Relationships	NA	NA	8	8	NA	NA	10	10
Principles	NA	NA	10	10	NA	NA	10	10
Problem Solving	NA	NA	5	5	NA	NA	5	5
Total Battery	16	33	56	56	5	34	59	59

NA = Not appropriate for these grade groups.

Table 2 presents words used in each item in the concrete level subtest, together with their attributes and the number of attributes distinguishing the distractors from the target. The three-letter descriptors indicate the initial letter, number of syllables, and type font of each word using these designations:

Initial Letters	Numbers of Syllables	Type Fonts
The first letter of the word itself is used.	S single syllable	E elite type, upper case
	M more than one syllable	L primary type, lower case
		U primary type, upper case

Figures of the same description are used in the identity level subtest, and the same sets of abbreviations will be used in referring to them.

Identity Level Subtest

This eight-item subtest is designed to assess whether a child has attained the concept noun at the identity level. In this subtest, the task and stimulus materials are like those employed at the concrete level. However, the correct choice on the second page of each item is presented in a different type font than on the preceding page. The distractors presented with the correct choice also appear in various type fonts so that the correct choice is not conspicuous due to its irregular type font. All instructions are given orally and no written instructions appear.

As in the concrete level subtest, the words used vary systematically with respect to initial letter, number of syllables, and type font. The

TABLE 2

DESCRIPTION OF WORDS EMPLOYED
IN THE CONCRETE LEVEL SUBTEST

Item	Number of Distractors	Number of Attributes on which Distractors Differ from Target	Correct Choice	Distractors
1	3	1 or 2	DSL (day)	BSL (bag), FSE (fly), WSL (who)
2	3	3	PML (pitcher)	SSU (say), RSU (ran), JSU (jump)
3	3	1 or 2	RML (ruler)	TME (today), NME (neighbor), SML (sleepy)
4	6	3	SSL (street)	HMU (however), EMU (erase), DMU (delay), AMU (about), CMU (cannot), PMU (perhaps)
5	6	1 or 2	TSL (town)	WSL (wish), ASL (are), CSE (call), HSL, (halt), GSE (green), PSE (park)
6	6	1 or 2	PML (pencil)	AME (around), SML (slipper), DML (deny), QME (quarrel), FML (farmer), BME (bottle)
7	6	0	MML (mother)	MML (mockery), MML (moment), MML (morale), MML (motel), MML (money), MML (model)
8	3	0	BSL (ball)	BSL (barb), BSL (bark), BSL (boil)

eight items are of various difficulties due to differing numbers of distractors and varying degrees of similarity between the distractors and the correct choices. The words used as distractors and the description of the words presented are identical to those provided in the concrete level subtest described above. The placement of the correct choice among the distractors is varied randomly across the eight items. The words used, their attributes, and the number of attributes distinguishing the distractors from the target for each item in the identity level subtest are shown in Table 3 with the three-letter abbreviations given above. The target noun presented on the first page of each item is always in lower case primary type.

Classificatory Level Subtest

This eight-item subtest is designed to assess whether a child has attained the concept noun at the classificatory level. In the first four items, a noun is presented on the left side of the page, and the child is asked to mark the word on the right which also names a person, place, or thing. In the remaining four items, the child is asked to mark all the words which name persons, places, or things, with no example given. The label "noun" is not used. The first two items use four words, including one noun. In Items 3 and 4, the child must select the noun from among seven alternatives. Items 5 and 6 use five words including two nouns, and Items 7 and 8, ten words including four nouns. The nouns are randomly interspersed among the other words. Instructions are read aloud, but written instructions also appear in the test booklet for each item.

TABLE 3

DESCRIPTION OF WORDS EMPLOYED
IN THE IDENTITY LEVEL SUBTEST

Item	Number of Distractors	Number of Attributes on which Distractors Differ from Target	Correct Choice*	Distractors
1	3	3	PME (pitcher)	SSU (say), RSU (ran), JSU (jump)
2	3	1 or 2	DSU (day)	BSL (bag), FSE (fly), WSL (who)
3	6	3	SSE (street)	HMU (however), EMU (erase), DMU (delay), CMU (cannot), SMU (about), PMU (perhaps)
4	3	2	RMU (ruler)	TME (today), SML (sleepy), NME (neighbor)
5	6	1 or 2	PMU (pencil)	AME (around), SML (slipper), DML (deny), FML (farmer), QME (quarrel), BME (bottle)
6	6	1 or 2	TSU (town)	ASL (are), CSE (call), WSL (wish), HSL (halt), GSE (green), PSE (park)
7	3	0 or 1	BSE (ball)	BSE (barb), BSL (bark), BSL (bail)
8	6	0 or 1	MME (mother)	MML (mockery), MML (morale), MME (moment), MME (motel), MME (money), MML (model)

*On the first page of each item, the correct choice is presented in primary type, lower case. The font indicated refers to the correct choice among the distractors on the second page of the item.

All words were presented in lower case primary type. Table 4 presents the words employed in each item, and indicates which were considered the correct and incorrect choices.

TABLE 4

WORDS EMPLOYED IN THE
CLASSIFICATORY LEVEL SUBTEST

Item	Example Word	Noun(s)	Other Words
1	day	girl	big, fat, who
2	pitcher	stocking	say, ran, jump
3	street	river	however, erase, defend, cannot, perhaps, about
4	table	lamp	may, when, should, your, pray, write
5	*	tent, Dick	go, rob, when
6	*	balls, wool	eat, said, after
7	*	brother, Russia teacher, Johnny	particularly, made, able, fallen, cannot, beautiful
8	*	geese, table, factories, cabin	above, largely, cashes, national, perfectly, flushes

*No example word was employed in items 5-8.

Formal Level Subtests

To determine if a concept has been attained at the formal level, three subtests are required: evaluating and defining, naming, and discriminating attributes.

Evaluating and Defining Subtest. This nine-item multiple-choice subscale is designed to assess a child's ability to define the concept noun and to evaluate instances as belonging or not belonging to the set "noun" based on the presence or absence of defining attributes. The first seven items present a word on the left-hand side of the page, labeled "X." On the right-hand side of the page are three other words.[1] The child is asked in what way "X" is different from all the other words. Five alternatives are presented for each item. The first four are usually statements of the form "X is _____" or "X may be _____." Exceptions include such statements as "X communicates meaning" and "X modifies a noun." The eighth item in this subtest presents one proper noun and one common noun on the left side of the page, together labeled "Group X." Two non-nouns to the right of the page are labeled "Group Y." The child is asked to indicate in what way the things in Group X are different from the things in Group Y. The correct alternative for the first eight items is always one of the defining attributes, as presented in Table 5. The fifth alternative for each item is "I don't know." The ninth item in this subtest determines whether a child can recognize a definition of the concept noun which is acceptable to content experts. The child is asked to choose the correct definition of the concept from among five alternatives, including "I don't know." Instructions are read aloud. The test question and alternatives appear in the test booklet and are also read aloud.

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[1] In Item 1, testing the attribute "word" itself, three nonsense syllables, rather than words, appear to the right of the page.

TABLE 5

DEFINING ATTRIBUTES BEING TESTED BY EACH OF THE FIRST EIGHT ITEMS OF THE EVALUATING AND DEFINING SUBTEST

Item	Defining Attribute
1	communicates meaning
2	names a subject of discourse
3	has number (singular or plural)
4	may show possession
5	may be used as a subject of a verb
6	may be used as an object of a verb
7	may be used as an object of a preposition
8	may name either a particular thing or a class of things

Naming Subtest. This nine-item multiple-choice subtest is designed to assess a child's ability to label the societally-accepted attributes of the concept noun. Two types of items are used in this subtest. Six items each present two groups of words[2] and the child must choose the label which best fits all of the words in the first group but does not fit all of the words in the second group. The remaining three items each present two groups of sentences with a noun underlined in each sentence. The child must choose the alternative which names the way in which all the words in group 1, but not the words in group 2, are used. All the items have five alternatives, including "I don't know." Instructions

[2] In Item 4, nonsense syllables, rather than words, are employed in the second group.

are read aloud. The test question and alternatives appear in the test booklet and are also read aloud. The names of the attributes tested by each item appear in Table 6.

TABLE 6

NAMES OF ATTRIBUTES TESTED
BY EACH ITEM OF THE NAMING SUBTEST

Item	Attribute Label
1	proper noun
2	subject of a sentence
3	common noun
4	word
5	noun
6	direct object
7	object of a preposition
8	possessive noun
9	plural noun

Discriminating Attributes Subtest. This seven-item subtest is designed to assess a child's ability to discriminate the societally accepted attributes of the concept noun. In each item, four words[3] are presented and the child is asked to indicate the one which has some particular property. In each

[3] In Item 1, one word and three nonsense syllables are presented.

case the correct alternative is the only drawing which possesses some defining attribute of the concept noun. The position of the correct alternative is varied randomly across the seven items. The defining attributes assessed by each item are presented in Table 7. Instructions are read aloud and also appear in the test booklet with each item.

TABLE 7

DEFINING ATTRIBUTES BEING TESTED BY EACH ITEM OF THE DISCRIMINATING ATTRIBUTES SUBTEST

Item	Attribute Distinguishing Correct Choice
1	communicates meaning
2	names something
3	singular noun
4	indicates ownership
5	can be used as the subject of a verb
6	can be used as the object of a verb
7	can be used as the object of a preposition

Supraordinate-Subordinate Relations Subtest

This eight-item multiple-choice subtest is designed to assess a child's ability to relate the concept noun to supraordinate, subordinate, and coordinate concepts. The child's understanding of four types of relations is assessed,

with two items for each type. In each item six or eight words are presented and a question is asked concerning the relationship of various subsets. Statements of the four relations tested are given in Table 8, as are lists of all the words presented for each item, and lists of those words which are examples of the supraordinate, subordinate, and/or coordinate classes to be related for each item. Examples of the word classes referred to in the items are "common nouns," "proper nouns," "verbs," "nouns," etc. The child must select the correct answer to the test question from among four alternatives, including "I don't know." Instructions are read aloud. The test questions and alternatives appear in the test booklet and are also read aloud.

Principles Subtest

This ten-item multiple-choice subtest is designed to asses whether a child understands various valid relationships among the properties of the concept noun. These relationships are stated as five principles, each of which is tested both with and without an example sentence. In both cases an incomplete statement of a valid property of the concept is presented. The child must complete the statement by selecting the correct alternative from among five phrases, including "I don't know." Instructions are read aloud. The test questions and alternatives appear in the test booklet and are also read aloud. The principle tested in each item is listed in Table 9a, which also indicates whether or not an example sentence is used with each item. Four additional principles have been formulated concerning the concept noun (Klausmeier, Sipple, & Katzenmeyer, 1973). Two of these are employed in

TABLE 8

RELATIONS TESTED AND CLASSES OF FIGURES EMPLOYED
IN THE SUPRAORDINATE-SUBORDINATE RELATIONS SUBTESTS

Item	Type of relationship*	Words presented	Type of first class(es) involved in statement of relation	Words in first class(es)	Type of second class(es) involved in statement of relation	Words in second class
1	I	John, honesty, class, cloud, valley, Denver	Supraordinate	John, honesty, class, cloud, valley, Denver	Subordinate	honesty, class, cloud, valley
2	I	Ohio, machine, honesty, flock, twelve, late, finish, been	Supraordinate	Ohio, machine, honesty, flock, twelve, late, finish, been	Subordinate	Ohio, machine honesty, flock
3	II	John, class, honesty, cloud, valley, Denver	Subordinate	class, honesty, cloud, valley	Supraordinate	John, class, honesty, cloud, valley, Denver
4	II	Ohio, machine, honesty, flock, twelve, late, finish, been	Subordinate	Ohio, machine, honesty, flock	Supraordinate	Ohio, machine, honesty, flock, twelve, late, finish, been
5	III	John, cloud, Ohio, baby school, Mary	Subordinate Subordinate	John, Ohio, Mary, cloud, baby, school	Supraordinate	John, cloud, Ohio, baby, school, Mary
6	III	school, Harry, teach, family greet, remember	Subordinate Subordinate	school, Harry, family teach, greet, remember	Supraordinate	school, Harry, teach, family, greet, remember
7	IV	John, cloud, Ohio, baby, school, Mary	Coordinate	John, Ohio, Mary	Coordinate	cloud, baby, school
8	IV	remember, family, teach, wool, listen, valley	Coordinate	remember, teach, listen	Coordinate	family, wool valley

*The four relationships are as follows:

I. Some but not all members of a supraordinate class belong to a given subclass.
II. All members of a subclass are also members of a higher class.
III. The sum of the members of the subclasses equals the sum of the members of the supraordinate class.
IV. The members of one coordinate class are not members of another coordinate class.

the problem-solving subtest. The remaining two principles are not assessed in this battery.

Problem-Solving Subtest

This five-item multiple-choice subtest is designed to assess a child's ability to apply knowledge of the concept noun in a particular problem-solving situation. Two types of items are employed. For two of the items, four sets of three words each are presented, and the child is asked to select the group consisting of words to which a particular principle can be applied. For example, the child may be asked to indicate the group of words which can be made plural by the addition of an "s" or "es." In addition to the four groups, the choice "I don't know" is presented. In the remaining three items, a sentence is presented with one word replaced by a blank space. The child must choose from five alternatives (including "I don't know") the part of speech which a given word would take in completing the sentence. The principle required for each item is presented in Table 9b. Instructions are read aloud. Test questions and alternatives appear in the test booklet and are also read aloud.

Additional Information for the Concept "Noun"

Information regarding the concept analysis of noun is available in the document by Klausmeier, Sipple, and Katzenmeyer (1973). This information includes definition of the concept; definition of relevant and irrelevant attributes; examples and nonexamples of the concept used to assess the concrete, identity, classificatory, and/or formal levels and, in supraordinate-subordinate

TABLE 9

PRINCIPLES ASSESSED AND USE OF EXAMPLE SENTENCES
IN THE PRINCIPLES AND PROBLEM-SOLVING SUBTESTS

a. Principles Subtest

Item	Principle*	Format
1	Va	with example sentence
2	Vb	with example sentence
3	I	with example sentence
4	III	with example sentence
5	Vc	with example sentence
6	I	without example sentence
7	III	without example sentence
8	Va	without example sentence
9	Vb	without example sentence
10	Vc	without example sentence

b. Problem-Solving Subtest

Item	Principle*	Format
1	II	without example sentence
2	IV	without example sentence
3	Va	with example sentence
4	Vb	with example sentence
5	Vc	with example sentence

*The five principles are as follows:

I. If a noun names one person, place, or thing, it is singular.

II. The plural form of nouns is made in most cases by adding s or es to the singular form.

III. A noun may show ownership.

IV. The possessive form of a noun is made by adding an apostrophe and an s to both singular and plural forms that do not end in s.

V. A noun may be used in a sentence as the subject of a sentence (part a), the direct object of a verb (part b), or an object of a preposition (part c).

relations, principles and/or problem solving; taxonomy of concepts related to noun; and principles related to the concept. The source also gives a description of the content of each item in terms of the number and nature of the nonexamples used in the concrete, identity, and classificatory subtests, descriptions of the relationships being assessed in the supra-ordinate-subordinate relations subtest, the attributes tested in the discriminating attributes subtest, principles being tested in the principles and problem-solving subtests, and labels tested in the naming subtest.

DEVELOPMENT OF THE CONCEPTUAL LEARNING AND DEVELOPMENT ASSESSMENT SERIES III: NOUN

Guidelines Used in Test Development

At the beginning of the test development activity the following guidelines were established for test construction and selection of a concept to be assessed. Test materials and instructions were to be appropriate for use with children from preschool age through high school and the test was to be group administered. It was necessary to choose a concept which could be presented in a paper-and-pencil format, which lent itself to definition in terms of defining attributes, and which was found in typical school curricula. The concept to be assessed had to be part of a taxonomy of related concepts, so that cognizing supraordinate and subordinate relationships could be tested; it also had to be usable in cognizing principles and in problem solving.

The concept noun was chosen to satisfy these guidelines for the curriculum area of English. Three other batteries were constructed to assess concepts in other curriculum areas.

A second set of guidelines was used in developing the directions for test administration and item formats. The purpose of these guidelines was to ensure that valid responses could be obtained from children of all ages. First, "practice" questions would be offered. Second specific repetitions of instructions or questions would be prescribed for use with younger children to ensure that they fully grasped the nature of the task. Third, all items would be read aloud by the test administrator since reading ability was not the specific measurement objective. Fourth, attractive item formats would be used to engage the interest of the children. Fifth, all stimulus and response materials, such as in the classificatory items, would be arranged in a left-to-right flow. Sixth, items and pages would be designed so that children could easily keep their places.

Writing Items

Items were written according to specifications provided by the concept analyses and the guidelines reviewed earlier. Item writing was done by scholars at the Wisconsin Research and Development Center for Cognitive Learning who were knowledgeable in the area of conceptual learning and development and use of the CLD model. Guidance for item writing was provided by a measurement specialist who reviewed and edited all test items.

Review of Test Battery Content by Specialists

The test battery was reviewed for content accuracy by a content specialist in the area of English. Any inaccuracies in items were corrected at that time.

Tryout of Items

After the reviewing and editing were completed, the items and test directions were given an empirical tryout in spring of 1973 using a small group of students in each of grades K, 3, 6, and 9. Results of the tryout provided information regarding the clarity of instructions and illustrations, comprehensibility of test questions and alternatives, and amount of time needed to administer the battery. Finally, the results were examined to see if the younger children were biased toward selecting particular answer positions in the test booklet. Children selected for participation in the tryout included an equal number of boys and girls in the categories of high, medium, and low scholastic achievers in order to ensure that information concerning clarity of directions and estimates of time needed to administer the test would be generalizable to the entire school populations. As a result of the tryout, items and test instructions were further revised and became the preliminary edition of the battery.

Preliminary Edition

The preliminary edition of the battery was used in spring of 1973. The site was a small Midwestern city, and all children tested were enrolled in public schools. The preliminary edition was administered to kindergartners, third, sixth, and ninth graders. Approximately 100 children were tested at each of the grade levels. Test administrations were done by trained personnel from the Wisconsin Research and Development Center for Cognitive Learning.

The preliminary edition provided several types of information: analysis of the difficulty and discrimination indices of each item, reliability of the test, and the usability of the test with children in different grade groups.

Results indicated that item revisions were required to produce final test forms which would be suitable for the intended population of normal school children. It was concluded that the directions were appropriate, with slight modifications, for group administration to children of various ability levels in a wide range of grade groups.

Development of Final Edition

Changes to the Preliminary Edition. At the completion of the analyses and review of the preliminary edition, a final edition of the battery was developed. The most significant differences between the two editions were the rewriting of several items. Specifically, in the concrete level and identity level subtests, items and their alternatives were rearranged. In the classificatory level subtest, one item was replaced and several alternates were changed. In the discriminating attributes subtest, one item was replaced, three were added, and instructions were made more clear. Eight evaluating items were constructed at this time, since no such items existed in the preliminary version. In the naming subtest, two items were replaced and a few alternatives were modified. Minor revisions were made to alternatives in the supraordinate-subordinate relationships subtest. One item was replaced and one item was added to the problem solving subtest. Two items were dropped and four were replaced in the principles subtest. No new directions for administration of any new items, including the evaluating items, were required since these items were incorporated into an existing test booklet and were formated similarly to the items just preceding them.

Production of Final Test Materials. A number of factors were considered in constructing the battery booklets to increase standardization of administration. The points incorporated in the final battery ensure that the children perform to their best advantage. First, instructions specific to each item are read aloud and also appear in the test booklet, reducing the influence of reading ability on test scores. Second, the STOP instruction is prominently placed at the end of each item or bottom of each page as in the concrete and identity subtests. Third, readability of the print is enhanced by use of a primary typewriter and sufficient spacing between items to eliminate confusion. Fourth, attractive item formats would be used to engage the interest of the children. Fifth all stimulus and response materials would be arranged in a left-to-right flow. Sixth, items and pages would be designed so that children could easily keep their places.

The test is produced in four booklets and children mark their answers directly on the test booklets.

Writing of Test Administration Manuals. The general instructions were prepared to increase the uniformity with which the test is administered. Procedures and materials to be used in the testing program are clearly outlined in Development of Conceptual Learning and Development Series III: Noun (Klausmeier, Ingison, Sipple & Katzenmeyer, 1973).

Instructions for administering specific subtests were developed on the basis of information gathered from the tryout of items on a small sample of children, criticisms and suggestions of test specialists, and suggestions of personnel who administered the test. The main criteria for these directions were clarity and usability. The test administration manual, found in

the document Development of Conceptual Learning and Development Assessment Series III: Noun (Klausmeier, Ingison, Sipple & Katzenmeyer, 1973), was provided for the preliminary edition, but it serves equally well for the final edition with appropriate substitutions of the text of the new items. By using a new copy of the test in conjunction with the manual, test administration may be standardized.

Computerized Analyses of Test Results. All information collected during the process of test development was prepared for electronic data processing. Personnel from the Wisconsin Research and Development Center for Cognitive Learning first transferred each child's responses from a test booklet to an answer sheet, and then keypunched these responses on computer cards. A computer program was used to score the data and generate records which were used in subsequent analyses.

Summary

This section of the technical manual has emphasized the steps taken at each point in the development of the test battery. From the formulation of the theoretical framework and rationale, to the item writing and editing, through the tryout and preliminary edition, steps were taken to develop a final version of the instrument that would measure the level of conceptual attainment and usage of the concept noun.

II

STANDARDIZATION

The standardization of the Conceptual Learning and Development Assessment Series III: Noun was designed to provide information about the test and its appropriateness for use with populations of normal children across a span of several grade groups.

DESCRIPTION OF THE STANDARDIZATION SAMPLE

The standardization testing was conducted in fall of 1973 in Beloit, Wisconsin. Beloit's child and adult populations are representative of many small manufacturing-industrial communities in the Midwest. In 1972 the Beloit population was 35,729, including a black population of 2606 (7 percent of the total population), 17,255 persons (48 percent of the total) under 25 years of age. The economic level of the community is somewhat higher than the average for Midwest industrial communities: The 1970 average income per household was $9460.00 and the median home value was $18,000.00 (Hooper & Klausmeier, 1973).

In the Beloit public school system there are 14 elementary schools, 3 junior high schools, and 1 senior high school. Total enrollment in these schools at the time of the standardization was approximately 10,000 students. Schools in which children were tested were selected in accord with the representative socioeconomic, ethnic, and general demographic classifications found in the city of Beloit (Hooper & Klausmeier, 1973).

Stratification variables used in selecting the population within each school were grade group and sex. Children from grades 1, 4, 7, and 10 were tested with an approximately equal number of boys and girls from each grade. The size, mean age, and range of age of the standardization sample for each grade group are presented in Table 10.

In the first year of the study, intact classrooms were randomly selected from among the schools chosen to represent the range of demographic characteristics discussed earlier. These children also served as the standardization sample for each of the other three batteries developed in the Conceptual Learning and Development Assessment Series.

TABLE 10

TOTAL NUMBER OF CHILDREN, MEAN AGE, AND AGE RANGE AT EACH GRADE GROUP IN THE STANDARDIZATION SAMPLE

Grade Group	Number		Mean Age (in years and months)	Age Range (in years and months)
1	Total	83	6 - 7	6 - 0 to 7 - 1
	Boys	41	6 - 7	6 - 0 to 7 - 1
	Girls	42	6 - 7	6 - 1 to 7 - 1
4	Total	95	9 - 7	9 - 0 to 10 - 5
	Boys	47	9 - 7	9 - 0 to 10 - 4
	Girls	48	9 - 8	9 - 0 to 10 - 5
7	Total	93	12 - 7	11 - 11 to 13 - 5
	Boys	45	12 - 7	12 - 0 to 13 - 5
	Girls	48	12 - 6	11 - 11 to 13 - 2
10	Total	91	15 - 6	14 - 11 to 16 - 4
	Boys	45	15 - 6	15 - 0 to 16 - 4
	Girls	46	15 - 5	14 - 11 to 16 - 2

ADMINISTRATION OF THE TEST TO THE STANDARDIZATION SAMPLE

The battery was administered to the standardization sample according to the instructions specified in the Development of Conceptual Learning and Development Assessment Series III: Noun (Klausmeier, Ingison, Sipple, & Katzenmeyer, 1973). Tests were administered by trained personnel from the Wisconsin Research and Development Center for Cognitive Learning. For grades 4, 7, and 10 the battery was administered to classroom groups of 20 to 30 children, while for the first grade it was administered to smaller groups of five to seven children. The entire battery was read to children regardless of grade level. Children marked their answers directly on the test pages; a separate answer sheet was not used.

MEANS AND STANDARD DEVIATIONS FROM THE STANDARDIZATION SAMPLE

Table 11 gives summary data for the raw scores resulting from the standardization testing. Means and standard deviations are given for each grade group on each subtest administered as well as on a combined formal level score, a total levels score, and a total uses score. Appendix A contains the same summary data for each sex for each grade group.

As mentioned in Chapter 1, it is not necessary or desirable to administer all items or subtests to each grade group. Since it was assumed, based on information collected using the preliminary version of the battery, that children in the highest grade group would respond correctly to all concrete level and identity level items, those subtests were not administered to grade group 10.[4] On the other hand, primary-aged children respond

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[4]Although summary data on the concrete level and identity level subtests are presented for the grade groups 4 and 7, examination of the data suggests that the subtests are too easy for use with grades 4 and 7 as well (see Table 1, Chapter 1).

incorrectly to most items in the three concept usage subscales: supra-ordinate-subordinate relations, principles, and problem solving. Therefore, those three subtests were not administered to grade group 1 of the standardization sample. All other subtests were administered to each grade group.[5]

[5] The summary data presented in Table 11 on children in the grade 1 group on the classificatory and formal subtests, and on grade 4 children on the uses subtests indicate that these subtests are also of inappropriate difficulty for use with these grade groups, and their use is not recommended (see Table 1, Chapter 1).

TABLE 11

MEANS AND STANDARD DEVIATIONS OF RAW SCORES ON EACH SUBTES
AND ON A COMBINED FORMAL SCORE, TOTAL LEVELS SCORE, AND TOTAI ES
SCORE, BY GRADE GROUP FOR THE STANDARDIZATION SAMPLE

Subtest	Grade Group			
	1(n = 83)	4(n = 95)	7(n = 93)	10(n = 91)
Concrete (8 items)				
Mean	6.76	7.97	7.98	NA[a]
SD	1.22	.18	.15	
Identity (8 items)				
Mean	4.69	7.86	7.97	NA[a]
SD	1.87	.43	.18	
Classificatory (8 items)				
Mean	.37	4.54	6.52	6.92
SD	.85	1.86	1.72	1.65
Evaluating & Defining (9 items)				
Mean	.00	1.85	3.91	5.79
SD	.00	1.48	2.11	2.29
Discriminating Attributes (7 items)				
Mean	.07	4.07	5.08	5.04
SD	.30	1.61	1.39	1.26
Naming (9 items)				
Mean	.04	1.93	3.47	5.02
SD	.19	1.52	2.15	2.38
Combined Formal (25 items)				
Mean	.11	7.85	12.46	15.86
SD	.35	2.95	4.49	4.84
Total Levels (49 items)				
Mean	11.93	28.22	34.92	38.78
SD	3.09	4.08	5.33	5.83
Supraordinate-Subordinate Relationships (8 items)				
Mean	NA[b]	2.71	4.04	5.01
SD		1.33	1.52	1.70

TABLE 11 (cont.)

Subtest	Grade Group			
	1(n = 83)	4(n = 95)	7(n = 93)	10(n = 91)
Principles (10 items)				
Mean	NA[b]	2.59	4.82	6.43
SD		1.61	2.16	2.09
Problem Solving (5 items)				
Mean	NA[b]	1.00	2.19	2.62
SD		.96	1.24	1.40
Total Uses (23 items)				
Mean	NA[b]	6.29	11.05	14.05
SD		2.81	3.81	4.23

[a]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too easy for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group. All children in this grade group received full credit for this subtest in the computation of the total levels score.

[b]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too difficult for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group.

III

STATISTICAL PROPERTIES

In reporting statistical data, three summary scores have been employed. The three subtests which are part of the formal level have been included in the combined formal level score which is equal to their sum. Inasmuch as the scores on these three subtests are always used in conjunction to assess attainment at the formal level, information on their individual properties is of lesser interest. A total levels score equal to the sum of the concrete level, identity level, classificatory level, and combined formal scores and a total uses score equal to the sum of the supraordinate-subordinate relationships, principles, and problem-solving subtest scores are also presented. These two total scores provide summative indices of the two major aspects of the CLD model, namely conceptual attainment and conceptual utilization and extension.

RELIABILITY

Internal consistency for this battery was determined by the use of Hoyt's analysis of variance procedure, which is algebraically equivalent to Kuder Richardson's formula 20 and Cronbach's coefficient alpha. Internal consistency is of more interest than test-retest reliability in this battery, given that children's attainment of concepts is not expected to remain stable over time. Table 12 presents the Hoyt reliability coefficients and standard

errors of measurement of the individual subtests and of the combined formal level score, total levels score, and total uses score within each grade group and across the four grade groups.

Examination of Table 12 reveals that of the 28 Hoyt reliabilities reported over half are .70 or better. Inspection of Table 11 containing means and standard deviations indicates that many of the lower reliabilities were obtained in cases where subtest means were over 90 percent of the total possible subtest score and standard deviations were very small. Means in this range and low standard deviations indicate an attenuation of the range of obtained scores which precludes higher Hoyt reliabilities being obtained. Although these subtests do not discriminate among the majority of the children in these grade groups, they provide valuable information in that they identify children who may not have attained the corresponding level of conceptual development or facility in concept utilization. Other low reliabilities were obtained in cases where the associated means and standard deviations were very low, again precluding higher Hoyt reliabilities being obtained. These subtests will nonetheless identify children who have attained higher levels of conceptual development or greater facility in concept utilization.

ITEM DIFFICULTIES (PERCENT OF CORRECT RESPONSE)

Item difficulties in the form of percent of correct response to each item by grade group and across the grade groups are included in Appendix B. Point biserial correlations of each item with the total test score across the four grade groups are also presented.

TABLE 12

HOYT RELIABILITY COEFFICIENTS AND STANDARD ERRORS OF MEASUREMENT ON EACH SUBTEST AND ON A COMBINED FORMAL SCORE, TOTAL LEVELS SCORE, AND TOTAL USES SCORE, BY GRADE GROUP AND ACROSS THE FOUR GROUPS FOR THE STANDARDIZATION SAMPLE

Subtest	Grade Group				
	1 (n = 83)	4 (n = 95)	7 (n = 93)	10 (n = 91)	Combined Grades (n = 362)
Concrete (8 items)					
Reliability	.49	NR[a]	NR[a]	NA[b]	.63
SE_M	.81				.45
Identity (8 items)					
Reliability	.67	NR[a]	NR[a]	NA[b]	.85
SE_M	1.01				.59
Classificatory (8 items)					
Reliability	NR[c]	.64	.71	.77	.91
SE_M		1.04	.87	.73	.85
Combined Formal (25 items)					
Reliability	NR[c]	.49	.78	.82	.92
SE_M		2.06	2.07	2.03	1.87
Total Levels (49 items)					
Reliability	NR[c]	.64	.80	.84	.95
SE_M		2.43	2.38	2.29	2.38
Supraordinate-Subordinate Relationships (8 items)					
Reliability	NA[d]	NR[c]	.44	.57	.78[e]
SE_M			1.07	1.04	.99
Principles (10 items)					
Reliability	NA[d]	NR[c]	.59	.60	.83[e]
SE_M			1.32	1.25	1.15
Problem Solving (5 items)					
Reliability	NA[d]	NR[c]	.39	.58	.67[e]
SE_M			.86	.82	.75
Total Uses (23 items)					
Reliability	NA[d]	NR[c]	.71	.78	.91[e]
SE_M			2.02	1.93	1.78

TABLE 12 (cont.)

[a]NR (Not Reported). Upon examination of the results of the standardized testing, as indicated by the means and standard deviations reported in Table 11, this subtest was found to be too easy for use with this grade group (see Table 1, Chapter 1). Accordingly, reliability information would be meaningless and is not reported.

[b]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too easy for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group. All children in this grade group received full credit for this subtest in the computation of the total levels statistic and in the computation of the combined grades concrete and identity subtest statistics.

[c]NR (Not Reported). Upon examination of the results of the standardized testing, as indicated by the means and standard deviations reported in Table 11, this subtest was found to be too difficult for use with this grade group (see Table 1, Chapter 1). Accordingly, reliability information would be meaningless and is not reported.

[d]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too difficult for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group.

[e]Primary aged children who did not receive this subtest were treated as earning total scores of zero in computing test statistics across grades.

The point biserial correlations were obtained by relating each of the items in the concrete level, identity level, classificatory level, and combined formal level subtests to the total levels score and each of the items in the supraordinate-subordinate relationships, principles, and problem-solving subtests to the total uses score.

The fact that a greater percent of children answer a test item correctly in higher grade groups than in lower grade groups provides some evidence for the validity of the item. In grade groups 7 and 10 it is more likely that children have received instruction in the concept noun than it is in grade groups 1 and 4. Thus it is expected that they would perform better than the children in the lower grade groups. The item difficulties reported in Appendix B conform to this expected pattern in almost all cases.

INTERCORRELATION OF THE TOTAL LEVELS SCORE WITH THE TOTAL USES SCORE

The intercorrelation of the total levels score with the total uses score is presented in Table 13 for each of the grade groups and across all the grade groups. The intercorrelation of the scores was not computable for grade group 1, since they did not receive any of the uses subtests. The range of correlations within each grade group is .45 to .81; the intercorrelation of the scores when all grade groups are combined is .90. These intercorrelations give support to the assumption that concept utilization is positively related to concept attainment.

PATTERNS OF CONCEPT ATTAINMENT

One important use of the Conceptual Learning and Development Assessment Series III: Noun is in the placement of individual children on the continuum

TABLE 13

INTERCORRELATION OF THE TOTAL LEVELS SCORE AND THE TOTAL USES SCORE, BY GRADE GROUP AND ACROSS GRADE GROUPS FOR THE STANDARDIZATION SAMPLE

Grade Group	Correlation
1 (n = 83)	NA[a]
4 (n = 95)	.45
7 (n = 93)	.68
10 (n = 91)	.81
All Grade Groups (n = 362)	.90[b]

[a] NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, all of the uses subtests were judged to be too difficult for use with first-grade children. Thus, when the final edition was administered these subtests were not included for this grade group.

[b] Primary-aged children who did not receive the uses subtests were treated as earning total scores of zero on total uses for the purpose of this correlation.

of conceptual development with respect to the concept noun. For some applications it is desirable to reduce this information to the single datum of the level at which the child is performing. To facilitate this placement, a scoring scheme has been developed to indicate mastery vs. nonmastery of each of the concrete level, identity level, classificatory level, and combined formal subtests. All items are given equal weight, and full attainment of a level is indicated by a score greater than or equal to a predefined criterion score on the corresponding subtest. These criteria are presented in Table 14.

TABLE 14

NUMBER OF ITEMS AND CRITERIA DEFINING FULL ATTAINMENT FOR EACH CONCEPT LEVEL

Subtest	Number of Items	Criterion for Full Attainment
Concrete	8	7 correct
Identity	8	7 correct
Classificatory	8	7 correct
Formal		
Evaluating and Defining	9	20 items correct or approximately 80% of combined formal items
Discriminating Attributes	7	
Naming	9	

Inasmuch as the test battery charts a child's passage through qualitatively different levels of conceptual attainment as additional cognitive operations are acquired, traditional indices of test performance suitable for use with norm-referenced measures are not entirely appropriate and may not adequately reflect the performance of the battery. Accordingly, in addition to Hoyt coefficients of reliability and traditional item statistics, a criterion-referenced scoring scheme is presented, and patterns of percent mastery across grade groups and across subtests assessing successive levels of conceptual attainment are also presented and discussed.

Table 15 presents the number and proportion of children within and across the four grade groups who mastered each of the four levels of concept attainment.

According to the CLD model, the percentage of children passing each of the four successive levels should decrease within each grade group. Furthermore, for each of the four levels, the percentage of children passing should increase from the lower to the higher grade groups. Inspection of Table 15 reveals that no exceptions to these predictions occurred. Overall, the proportion of the 362 children who passed the various levels was .93 concrete level, .81 identity level, .40 classificatory level, and .08 formal level. In the light of the theoretical predictions of the CLD model, these results support the validity of mastery decisions made on the basis of the test battery.

TABLE 15

NUMBER AND PROPORTION OF EACH GRADE GROUP THAT FULLY MASTERED EACH LEVEL OF ATTAINMENT

Grade	Concrete	Identity	Classificatory	Combined
1st (n = 83)				
Number	56	16	0	0
Proportion	.67	.19	.00	.00
4th (n = 95)				
Number	95	92	16	0
Proportion	1.00	.97	.17	.00
7th (n = 93)				
Number	93	93	59	3
Proportion	1.00	1.00	.63	.03
10th (n = 91)				
Number	91	91	68	25
Proportion	1.00	1.00	.75	.27
All Grades (n = 362)				
Number	335	292	143	28
Proportion	.93	.81	.40	.08

In addition to placing individual children at one of the four levels, these mastery decisions permit the examination of validity of the test battery in the light of the hierarchical nature of the model. Inasmuch as attainment of each level requires the presence of conceptual abilities characteristic of the preceding levels, the model predicts that no child should master any one of the four levels subtests unless he also masters all preceding levels subtests. It is hypothesized that each successive level of attainment requires the use of one or more new cognitive operations. Therefore each subtest would be more difficult than the previous one. A given pattern of attainment as indicated by the four mastery decisions derived from the levels subtests may be represented by a string of four letters, each either "P" or "F," denoting mastery (Passing) or nonmastery (Failing) of the corresponding subtest. The leftmost letter in such a string represents the concrete level subtest; the second, identity level; the third, classificatory; and the rightmost, combined formal. Thus, the pattern of attainment of a child who mastered the concrete level and identity level subtests and failed to master the classificatory level and combined formal subtests would be represented by the string "PPFF." On the basis of the hierarchical nature of the model, it is predicted that all children will attain one of the following 5 of the 16 possible patterns: FFFF, PFFF, PPFF, PPPF, and PPPP.

Table 16 shows the number and proportion of each grade group that attained the successive levels according to the five patterns and also the number and proportion of each grade group that were exceptions to the five patterns. Information regarding those who performed according to the predicted patterns is given in the top five rows; the exceptions are given in

the lower rows. Of the 362 children, 100 percent performed according to the predicted patterns.

The high percentage of children conforming to the predicted patterns supports the major proposition of the CLD model, that individuals attain concepts in a highly predictable pattern involving the four successive levels: concrete, identity, classificatory, and formal. The results also support the validity of the test battery as effectively charting the course of the development of the concept noun.

TABLE 16

NUMBER AND PROPORTION OF FOUR GRADE GROUPS CONFORMING AND NOT COMFORMING TO PREDICTED SEQUENCE OF ATTAINMENT

Pass-Fail Sequence	1st (n = 83)	4th (n = 95)	7th (n = 93)	10th (n = 91)	All Grades (n = 362)
FFFF	27 .33	0 .00	0 .00	0 .00	27 .07
PFFF	40 .48	3 .03	0 .00	0 .00	43 .12
PPFF	16 .19	76 .80	34 .37	23 .25	149 .41
PPPF	0 .00	16 .17	56 .60	43 .47	115 .32
PPPP	0 .00	0 .00	3 .03	25 .27	28 .08
Subtotal Conforming	83 1.00	95 1.00	93 1.00	91 1.00	362 1.00
FFFP	0 .000	0 .00	0 .00	0 .00	0 .00
FFPF	0 .00	0 .00	0 .00	0 .00	0 .00
FFPP	0 .00	0 .00	0 .00	0 .00	0 .00
FPFF	0 .00	0 .00	0 .00	0 .00	0 .00
FPFP	0 .00	0 .00	0 .00	0 .00	0 .00
FPPF	0 .00	0 .00	0 .00	0 .00	0 .00
FPPP	0 .00	0 .00	0 .00	0 .00	0 .00
PFFP	0 .00	0 .00	0 .00	0 .00	0 .00
PFPF	0 .00	0 .00	0 .00	0 .00	0 .00
PFPP	0 .00	0 .00	0 .00	0 .00	0 .00
PPFP	0 .00	0 .00	0 .00	0 .00	0 .00
Subtotal Not Conforming	0 .00	0 .00	0 .00	0 .00	0 .00

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APPENDIX A

DESCRIPTIVE SCALE STATISTICS FOR THE NOUN BATTERY

TABLE A-1

MEANS AND STANDARD DEVIATIONS OF RAW SCORES ON EACH SUBTEST AND ON A COMBINED FORMAL SCORE, TOTAL LEVELS SCORE, AND TOTAL USES SCORE, BY GRADE GROUP, FOR BOYS IN THE STANDARDIZATION SAMPLE

	Grade Group			
Subtest	1(n = 41)	4(n = 48)	7(n = 45)	10(n = 44)
Concrete (8 items)				
Mean	6.56	7.96	7.96	NA[a]
SD	1.42	.20	.21	
Identity (8 items)				
Mean	4.46	7.83	7.96	NA[a]
SD	1.94	.48	.21	
Classificatory (8 items)				
Mean	.29	4.17	6.24	6.75
SD	.60	1.96	1.90	1.89
Evaluating & Defining (9 items)				
Mean	.00	1.60	3.62	5.36
SD	.00	1.14	2.16	2.54
Discriminating Attributes (7 items)				
Mean	.10	3.75	4.78	4.95
SD	.37	1.34	1.46	1.22
Naming (9 items)				
Mean	.00	1.79	3.31	4.70
SD	.00	1.49	2.27	2.39
Combined Formal (25 items)				
Mean	.10	7.15	11.71	15.02
SD	.37	2.64	4.78	5.11
Total Levels (49 items)				
Mean	11.41	27.15	33.87	37.71
SD	3.10	3.64	5.69	6.13
Supraordinate-Subordinate Relationships (8 items)				
Mean	NA[b]	2.77	4.09	4.89
SD		1.24	1.61	1.78

TABLE A-1 (cont.)

Subtest	Grade Group 1(n = 41)	4(n = 48)	7(n = 45)	10(n = 44)
Principles (10 items)				
Mean	NA[b]	2.44	4.53	5.95
SD		1.54	2.19	2.35
Problem Solving (5 items)				
Mean	NA[b]	.90	2.00	2.27
SD		.88	1.24	1.45
Total Uses (23 items)				
Mean	NA[b]	6.10	10.62	13.11
SD		2.75	3.93	4.50

[a]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too easy for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group. All children in this grade group received full credit for this subtest in the computation of the total levels score.

[b]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too difficult for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group.

TABLE A-2

MEANS AND STANDARD DEVIATIONS OF RAW SCORES ON EACH SUBTEST AND ON A COMBINED FORMAL SCORE, TOTAL LEVELS SCORE, AND TOTAL USES SCORE, BY GRADE GROUP, FOR GIRLS IN THE STANDARDIZATION SAMPLE

Subtest	Grade Group			
	1(n = 42)	4(n = 47)	7(n = 48)	10(n = 47)
Concrete (8 items)				
Mean	6.95	7.98	8.00	NA[a]
SD	.96	.15	.00	
Identity (8 items)				
Mean	4.90	7.89	7.98	NA[a]
SD	1.81	.38	.14	
Classificatory (8 items)				
Mean	.45	4.91	6.77	7.09
SD	1.04	1.69	1.52	1.38
Evaluating & Defining (9 items)				
Mean	.00	2.11	4.19	6.19
SD	.00	1.74	2.06	1.96
Discriminating Attributes (7 items)				
Mean	.05	4.40	5.35	5.13
SD	.22	1.80	1.28	1.31
Naming (9 items)				
Mean	.07	2.06	3.63	5.32
SD	.26	1.57	2.05	2.36
Combined Formal (25 items)				
Mean	.12	8.57	13.17	16.64
SD	.33	3.10	4.13	4.48
Total Levels (49 items)				
Mean	12.43	29.27	35.92	39.83
SD	3.03	4.25	4.82	5.38
Superordinate-Subordinate Relationships (8 items)				
Mean	NA[b]	2.64	4.00	5.13
SD		1.42	1.46	1.62

TABLE A-2 (cont.)

Subtest	Grade Group 1(n = 42)	4(n = 47)	7(n = 48)	10(n = 47)
Principles (10 items)				
Mean	NA[b]	2.74	5.08	6.87
SD		1.67	2.12	1.73
Problem Solving (5 items)				
Mean	NA[b]	1.11	2.38	2.94
SD		1.03	1.21	1.29
Total Uses (23 items)				
Mean	NA[b]	6.49	11.46	14.94
SD		2.88	3.68	3.80

[a]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too easy for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group. All children in this grade group received full credit for this subtest in the computation of the total levels score.

[b]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too difficult for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group.

APPENDIX B

DESCRIPTIVE ITEM STATISTICS FOR THE NOUN BATTERY

TABLE B-1

DIFFICULTIES OF EACH ITEM IN THE TOTAL LEVELS SCORE BY GRADE GROUP, AND DIFFICULTIES AND POINT BISERIAL CORRELATIONS FOR THE SAME ITEMS COMBINING GRADE GROUPS FOR THE STANDARDIZATION SAMPLE

Item	1 (n = 83) Difficulty	4 (n = 92) Difficulty	7 (n = 93) Difficulty	10 (n = 91) Difficulty	Combined Grades (n = 362) Difficulty	r
Concrete Subtest						
1	.94	NR[a]	NR[a]	NA[b]	.99	.21
2	.99	NR[a]	NR[a]	NA[b]	1.00	.11
3	.92	NR[a]	NR[a]	NA[b]	.98	.25
4	.96	NR[a]	NR[a]	NA[b]	.99	.12
5	.90	NR[a]	NR[a]	NA[b]	.98	.26
6	.88	NR[a]	NR[a]	NA[b]	.97	.31
7	.47	NR[a]	NR[a]	NA[b]	.88	.62
8	.70	NR[a]	NR[a]	NA[b]	.93	.46
Identity Subtest						
9	.98	NR[a]	NR[a]	NA[b]	.99	.16
10	.52	NR[a]	NR[a]	NA[b]	.89	.57
11	.70	NR[a]	NR[a]	NA[b]	.93	.49
12	.65	NR[a]	NR[a]	NA[b]	.92	.51
13	.80	NR[a]	NR[a]	NA[b]	.95	.38
14	.63	NR[a]	NR[a]	NA[b]	.90	.52
15	.22	NR[a]	NR[a]	NA[b]	.80	.74
16	.20	NR[a]	NR[a]	NA[b]	.81	.74
Classificatory Subtest						
17	NR[c]	.55	.80	.88	.59	.63
18	NR[c]	.80	.91	.92	.70	.72
19	NR[c]	.80	.95	.95	.70	.76
20	NR[c]	.87	.97	.97	.73	.82
21	NR[c]	.49	.71	.87	.54	.71
22	NR[c]	.59	.82	.89	.60	.71
23	NR[c]	.49	.71	.87	.54	.71
24	NR[c]	.16	.66	.67	.38	.65
Combined Formal Subtest Evaluating & Defining						
25	NR[c]	.25	.61	.82	.43	.67
26	NR[c]	.27	.63	.81	.44	.66
27	NR[c]	.20	.49	.67	.35	.61

TABLE B-1 (cont.)

Item	1(n = 83) Difficulty	4(n = 92) Difficulty	7(n = 93) Difficulty	10(n = 91) Difficulty	Combined Grades (n = 362) Difficulty	r
28	NR[c]	.14	.38	.58	.28	.55
29	NR[c]	.24	.42	.62	.3[illegible]	.53
30	NR[c]	.21	.38	.53	.28	.51
31	NR[c]	.26	.29	.51	.27	.48
32	NR[c]	.17	.54	.70	.36	.62
33	NR[c]	.11	.17	.55	.21	.47
Discriminating Attributes						
34	NR[c]	.72	.91	.90	.65	.74
35	NR[c]	.77	.92	.97	.69	.77
36	NR[c]	.60	.87	.98	.64	.76
37	NR[c]	.54	.87	.81	.57	.71
38	NR[c]	.37	.43	.44	.32	.44
39	NR[c]	.55	.67	.56	.46	.50
40	NR[c]	.54	.40	.38	.34	.38
Naming						
41	NR[c]	.12	.38	51	.25	.56
42	NR[c]	.28	.34	.63	.32	.55
43	NR[c]	.20	.45	.54	.31	.50
44	NR[c]	.29	.60	.76	.43	.64
45	NR[c]	.21	.25	.46	.23	.42

[a]NR (Not Reported). Upon examination of the results of the standardized testing, as indicated by the means and standard deviations reported in Table 11, this subtest was found to be too easy for use with this grade group (see Table 1, Chapter 1). Accordingly, item statistics would be meaningless and are not reported.

[b]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too easy for use with this grade group. All children in this grade group received full credit for this subtest in the computation of the total levels statistic and in the computation of the combined grades concrete and identity subtest statistics.

[c]NR (Not Reported). Upon examination of the results of the standardized testing, as indicated by the means and standard deviations reported in Table 11, this subtest was found to be too difficult for use with this grade group (see Table 1, Chapter 1). Accordingly, item statistics would be meaningless and are not reported.

TABLE B-2

DIFFICULTIES OF EACH ITEM IN THE TOTAL USES SCORE BY GRADE GROUP, AND DIFFICULTIES AND POINT BISERIAL CORRELATIONS FOR THE SAME ITEMS COMBINING GRADE GROUPS FOR THE STANDARDIZATION SAMPLE

Item	1(n = 83) Difficulty	4(n = 95) Difficulty	7(n = 93) Difficulty	10(n = 91) Difficulty	Combined Grades (n = 362) Difficulty[c]	r[c]
Supraordinate-Subordinate Relationships Subtest						
1	NA[a]	NR[b]	.70	.77	.51	.60
2	NA[a]	NR[b]	.88	.93	.62	.71
3	NA[a]	NR[b]	.31	.51	.27	.49
4	NA[a]	NR[b]	.86	.93	.61	.71
5	NA[a]	NR[b]	.37	.57	.30	.55
6	NA[a]	NR[b]	.52	.58	.35	.63
7	NA[a]	NR[b]	.08	.16	.09	.25
8	NA[a]	NR[b]	.33	.55	.26	.56
Principles Subtest						
9	NA[a]	NR[b]	.62	.75	.44	.69
10	NA[a]	NR[b]	.48	.56	.35	.54
11	NA[a]	NR[b]	.67	.85	.49	.67
12	NA[a]	NR[b]	.57	.77	.40	.70
13	NA[a]	NR[b]	.25	.36	.21	.38
14	NA[a]	NR[b]	.80	.92	.52	.75
15	NA[a]	NR[b]	.49	.58	.35	.57
16	NA[a]	NR[b]	.40	.74	.33	.67
17	NA[a]	NR[b]	.28	.43	.23	.43
18	NA[a]	NR[b]	.26	.47	.22	.47
Problem Solving Subtest						
19	NA[a]	NR[b]	.55	.63	.33	.63
20	NA[a]	NR[b]	.33	.36	.25	.48
21	NA[a]	NR[b]	.70	.81	.45	.73
22	NA[a]	NR[b]	.49	.56	.34	.55
23	NA[a]	NR[b]	.12	.25	.12	.35

TABLE B-2 (cont.)

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[a]NA (Not Administered). On the basis of test results obtained with the preliminary edition of the battery, this subtest was judged to be too difficult for use with this grade group. Thus, when the final edition was administered this subtest was not included for this grade group.

[b]NR (Not Reported). Upon examination of the results of the standardized testing, as indicated by the means and standard deviations reported in Table 11, this subtest was found to be too difficult for use with this grade group (see Table 1, Chapter 1). Accordingly, item statistics would be meaningless and are not reported.

[c]Primary aged children who did not receive the Uses subtests were treated as answering all items incorrectly in the computation of items difficulties and biserial correlations combining grades.

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